EXAMINER'S AMENDMENT & STATEMENT OF REASONS FOR ALLOWANCE

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Amendments & Claim Status

Examiner's Amendment

[1] This Examiner's Amendment is responsive to (i) the telephone interview dated Aug. 11, 2009 (see attached; clarifying that the advisory action sent Jul. 22, 2009 was in error); and (ii) Amendment-G Under 37 CFR 1.116 filed Jul. 10, 2009. Claims 1-5, 10-11, and 15-16 remain pending; claims 6-9, 12-14 cancelled.

[2] An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

[3] Authorization for this Examiner's Amendment was given in a telephone interview with Fulchend Shende (Reg. No. L0311) on Aug. 11, 2009.

Amendment to the Claims

1. (Currently amended) A method for measuring a position of an object according to an image of the object captured by a camera unit wherein the object is contained within the image captured by the camera unit, the method comprising the steps of:

capturing an image containing an object using a camera unit with a lens system;

calculating a discrepancy of an incident beam of light penetrating the lens system of the camera unit relative to an optical center of the lens system; and

compensating a position of the object contained in the captured image according to the

calculated discrepancy;

wherein the camera unit is adapted to be positioned on one of an automobile and a movable robot, and the method includes the further step of outputting the compensated position of the object to the automobile or the movable robot;

wherein a distance between the object and the camera unit is not known prior to measuring the position of the object;

wherein the incident beam of light is directly projected from the object to the lens system; and

wherein said discrepancy is a minimum distance between the optical center and said incident beam of light.

2. (Currently amended) A method for measuring a position of an object with a combination of an image of the object captured by a camera unit and calibration information for the camera unit, the calibration information being prepared in advance in such a manner that a position of a measurement pixel of the image is correlated with a direction of an incident beam of light and a displacement from a reference point to the incident beam, the method comprising the steps of:

(a) capturing an image containing an object using a camera unit with a lens, the object being contained within the image captured by the camera unit;

(b) detecting a position of a pixel representative of the object in the image captured at step (a); and

(c) calculating the position of the object contained in the captured image according to the direction and the displacement of the incident beam, which are obtained from the calibration information with reference to the position of the pixel detected at step (b);

wherein the camera unit is adapted to be positioned on one of an automobile and a movable robot, and the method includes the further step of outputting the compensated position of the object to the automobile or the movable robot;

wherein the displacement of the incident beam of light relative to the reference point is a discrepancy of the incident beam of light relative to an optical center of the lens of the camera unit;

wherein said discrepancy is a minimum distance between the optical center and said incident beam of light;

wherein the incident beam of light is directly projected from the object to the lens of the camera unit; and

wherein the position of the object detected in step (b) is compensated according to said discrepancy.

3. (Currently amended) An apparatus for measuring a position of an object according to an image of the object captured by a camera unit wherein the object is contained within the image captured by the camera unit, the apparatus comprising:

an image input means for incorporating the image captured by the camera unit;

a pixel position detection means for detecting a position of a pixel representative of the object in the image incorporated by the image input means;

a storage means for storing calibration information which correlates the position of the pixel with both a direction of an incident beam of light originating from the object and a displacement from a reference point to the incident beam; and

a position calculation means for calculating the position of the object according to the direction and the displacement of the incident beam, which are derived from the calibration information with reference to the position of the pixel detected by the pixel position detection means;

wherein the camera unit is adapted to be positioned on one of an automobile and a movable robot, and the apparatus is operable to output the calculated position of the object to the automobile or the movable robot;

wherein said displacement of the incident beam indicates a discrepancy of the incident beam of light penetrating a lens system of the camera unit relative to an optical center of the lens system;

wherein said discrepancy is a minimum distance between the optical center of the lens system and said incident beam of light;

wherein said incident beam of light is directly projected from the object to the lens system of the camera unit; and

wherein the position of the object is compensated according to said discrepancy.

4. (Previously presented) The apparatus according to claim 3, wherein the camera unit comprises cameras in sets of at least two so as to take a plurality of images and the storage means stores the calibration information for each of said cameras.

5. (Original) The apparatus according to claim 3, wherein the pixel position detection means detects the position of the pixel representative of the object having a marker identifying a typical spot of the object.

6-9. (Canceled)

10. (Previously presented) A method for measuring a position of an object according to claim 1, wherein said discrepancy calculating step involves use of calibration information for the camera unit prepared in advance, wherein said method further involves generating said calibration information in the steps of:

projecting a beam of light on individual pixels of a camera image;

according to the beam of light incident on each pixel, calculating a displacement from a reference point to the incident beam of light; and

generating the calibration information by correlating a direction and the displacement of the incident beam of light with a position of each pixel.

11. (Previously presented) A method for measuring a position of an object according to claim 1, wherein said discrepancy calculating step involves use of calibration information for the camera unit prepared in advance, wherein said method further involves generating said calibration information in the steps of:

adjusting a first direction of the camera unit so that a first peak intensity of light emitted by a light source falls in a measurement pixel captured by the camera unit, and measuring a first relative position of the light source relative to the camera unit;

adjusting a second direction of the camera unit so that a second peak intensity of light emitted by the light source falls in the measurement pixel, and measuring a second relative position of the light source relative to the camera unit;

repeating determination of an incident beam of light impinging on the measurement pixel according to the first and second relative positions for predetermined measurement pixels;

calculating a displacement from a reference point to the incident beam of light for each of the measurement pixels; and

generating the calibration information which correlates a direction and the displacement of the incident beam of light with each of the measurement pixels.

12-14. (Canceled)

15. (Previously presented) A method according to claim 1, further comprising the step of outputting the compensated position of the object as an actual position of the object.

16. (Previously presented) A method according to claim 2, further comprising the step of outputting the calculated position of the object as an actual position of the object.

Allowable Subject Matter

[4] **Claims 1-5, 10-11,** and **15-16** allowed.

Statement of Reasons for Allowance

[5] The following is a statement of reasons for the indication of allowable subject matter:

Regarding **claims 1-3**, see Office Action at p. 8, Apr. 13, 2009 (stating that while the prior art of record teaches the camera unit being adapted to be positioned on one of an automobile and a movable robot, the prior art of record does not teach wherein the method further includes outputting the calculated position of the object to the automobile or the movable robot). **Claims 4-5, 10-11,** and **15-16** allowed by dependency.

Conclusion

[6] Any inquiry concerning this communication or earlier communications from the examiner should be directed to DAVID P. RASHID whose telephone number is (571)270-1578

and fax number (571)270-2578. The examiner can normally be reached Monday - Friday 7:30 - 17:00 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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